TEXAS A&M UNIVERSITY
REMOTE SENSING CENTER
COLLEGE STATION TEXAS 77843

College of Agriculture
College of Engineering
College of Geosciences
College of Science

TYPE I PROGRESS REPORT-NUMBER 3

Period: March 28, 1973 to May 27, 1973

TITLE: MONITORING THE VERNAL ADVANCEMENT AND RETROGRADATAION (GREEN WAVE EFFECT) OF NATURAL VEGETATION (MMC 667) (Contract No. NAS5-21857)

PRINCIPAL INVESTIGATOR: Dr. J. W. Rouse, Jr. (UN220)
Remote Sensing Center
Texas A&M University
College Station, Texas 77843

PROJECT DESCRIPTION:

This regional study monitors the vernal advancement and retrogradation of natural vegetation (green wave effect) using ERTS observations throughout the Great Plains Corridor. The green wave effect is charted by using the relatively homogeneous rangeland vegetation systems of the Mixed Prairie region in the central United States as phenological indicators. ERTS multispectral scanner data and ground observations collected from the network of ten test sites are used to measure vegetation changes during the life-time of ERTS-1. Attention is given to observing seasonal drought and other bioclimatic influences which impact upon management and production in agriculture. The overall objective of this investigation is to determine the effectiveness of ERTS-type data in monitoring the vegetation conditions of direct concern to rangeland management and agri-business decisions in this region.

ACCOMPLISHMENTS:

During the period covered by this report the following tasks were accomplished:

a) Computer programs previously developed to accumulatively assimilate specific vegetation data obtained from ground sampling at the ten network test sites were employed to summarize the initial vernal phase data. The automated summary has proved to be an important reference for noting the temporal fluctuations of vegetation parameters for each of the test sites.

b) All data logs, including those for ERTS-1 data and aerial photography, have been updated.

c) Planning for specific intensive field studies at the Throckmorton and College Station, Texas test sites has been accomplished. Sampling procedures have been developed and field tested for the collection of certain vegetation data, including cover and chlorophyll content measurements. Well documented sampling

procedures will be utilized to record in detail the vegetation conditions existing at the intensive sampling sites.

d) Intensive sampling at the Throckmorton test site has been initiated.

e) A Type II report assessing the status of the project during the autumnal phase, 1972 and presenting significant results was completed.

f) Computer analysis of MSS digital data were continued. 20 mile X 20 mile maps for each of the test sites have been made for selected dates during the autumnal phase. Procedures have been developed for routine location of 4 mile X 4 mile areas centered on the test sites. The initial 4 mile X 4 mile grey-scale maps are produced for selected dates and sites.

g) Progress is continuing for the development of procedures to use Band 5 and Band 7 data for the detection of temporal changes as a measure of quantity and quality of rangeland vegetation. Further work is currently underway using MSS digital data for the calculation

of band to band ratios and in evaluating the quantitative aspects of the resulting parameters.

h) NASA highflight aerial photography was used to pinpoint the ten test sites on the 20 mile X 20 mile computer grey-scale maps.

i) Large scale aerial photography has been obtained at the College Station (March 17), Sonora (March 18), and Throckmorton (April 29) test sites for multistage sampling and intensive study vegetation condition monitoring in conjunction with satellite overpass.

j) Image descriptors were assigned for all ERTS-1 imagery containing good quality Great Plains Corridor network test site data (Appendix).

SUMMARY OF SIGNIFICANT FINDINGS:

Continued evaluation of autumnal phase and early vernal phase data indicate that the quality of ERTS-1 imagery over the Great Plains Corridor test sites are adequate to show relatively small temporal changes in the condition and quantity of vegetation at the

several test sites. Vegetation changes measured from August through April are observable in reflectance changes recorded by ERTS. Vegetation changes due to grazing treatment and environmental conditions at the test sites are being monitored with ground data and ERTS-1 data, and appear adequate to complete all phases of the Great Plains Corridor investigation.

NASA highflight aerial photography proved to be an indispensable tool for locating the Great Plains Corridor test sites on the computer derived grey maps of ERTS-1 digital data.

DATA PRODUCT SUMMARY:

The ERTS-1 Imagery and Tape Receipts and Orders "Quick-Look" chart on the following page shows the status of ERTS-1 data inventory and data requests at the end of this reporting period.

Two retrospective data requests were placed during the period covered by this report. These request were sent on April 30, and May 14.

Receipt of ERTS-1 MSS standing order black and white products indicates a continued lag time of about four weeks from the date the satellite acquired the data. MSS color composite products ordered retrospectively

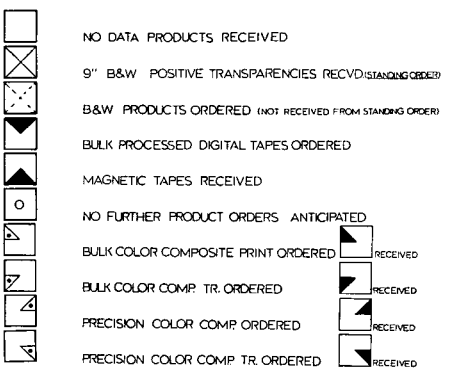
ERTS-1 IMAGERY AND TAPE

RECEIPTS AND ORDERS

GREAT PLAINS CORRIDOR TEST SITES

CYCLE	DATES	COLLEGE STATION	SONORA	THROCK-MORTON	WOOD-WARD	HAYS	SAND-HILLS	COTTON-WOOD	MANDAN	WES-LACO	CHICK-ASHA
0	7/25 - 7/30										
1	8/1 - 8/17										
2	8/19 - 9/4										
3	9/6 - 9/22										
4	9/24 - 10/10										
5	10/12 - 10/28										
6	10/30 - 11/15										
7	11/17 - 12/3										
8	12/5 - 12/21										
9	12/23 - 1/8										
10	1/10 - 1/26										
11	1/28 - 2/13										
12	2/15 - 3/3										
13	3/5 - 3/21										
14	3/23 - 4/8										
15	4/11 - 4/26										

SYMBOLS:



continue to arrive sporadically and are of varying quality. Order-receipt time has been ranging from about 6 weeks to 6 months. The extended lag time of MSS color products from the time of satellite data acquisition is a serious problem for timely interpretation of anticipated results.

Retrospective orders for MSS digital data are requiring six weeks or more from the time of the retrospective order. At this point it appears that computer analysis of data cannot begin less than three months from the date the satellite acquired the data. This extended data lag presents a serious problem concerning field verification of anomolies from the greater test area without obtaining extensive synoptic type data such as aircraft imagery for each of the satellite overpass dates.

SCHEDULED ACTIVITIES:

The following activities are scheduled for the next reporting period:

a) ERTS-1 data will be received and analyzed in a routine manner as set forth in the data analysis plan for the Great Plains Corridor investigation.

b) Computerized grey-scale printout maps will be obtained for each network test site data set.

c) Procedures will be developed for isolating specific areas which include only the network test site for specific studies. Computer analysis will begin for the intensive test sites at College Station and Throckmorton, Texas.

d) Field sampling for intensive investigations at Throckmorton and College Station, Texas will be continued with emphasis given to measuring small vegetation changes over extensive areas covered by the selected test sites. The thrust of these studies will be to monitor some of the major factors which may influence the temporal reflectance changes.

e) Network test site characterization will be initiated from existing aerial photography and field validation. Vernal phase ground data will be received from participating network test sites and the data summarized.

Careful attention will be given to observing apparent shifts in the phenophase development throughout the Great Plains Corridor. Timely verification of major vegetation changes will be documented as necessary.

f) Routine data handling, imagery evaluation and assignment of descriptors, product ordering and other project activities will continue.

APPENDIX

ERTS IMAGE DESCRIPTOR FORM

(See Instructions on Back)

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DATE March 30, 1973

PRINCIPAL INVESTIGATOR Dr. John W. Rouse, Jr.

GSFC UN220

ORGANIZATION Remote Sensing Center

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Range-land	Pasture	River	
120316474M	X	X	X	Haze
120216413M	X	X	X	Grassland, Dormant Vegetation
105816404MB	X	X	X	City, Fallow Field
113016413MB	X	X	X	City, Dormant Vegetation
109216305MB	X	X	X	Lake, Forest, Grassland
102016302MB	X	X	X	Broken Clouds
114616311MB	X	X	X	Forest, Dormant Vegetation
104116474MB	X	X	X	Broken clouds, Cirrus
111316382MB	X	X	X	Lake, Brush Grass-land
105916474MB	X	X	X	Lake, Brush Grass-land
120216425MB	X	X	X	Snow
102216405MB	X	X	X	Grassland
105916465MB	X	X	X	Grassland

*FOR DESCRIPTORS WHICH WILL OCCUR FREQUENTLY, WRITE THE DESCRIPTOR TERMS IN THESE COLUMN HEADING SPACES NOW AND USE A CHECK (✓) MARK IN THE APPROPRIATE PRODUCT ID LINES. (FOR OTHER DESCRIPTORS, WRITE THE TERM UNDER THE DESCRIPTORS COLUMN).

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ORGANIZATION Remote Sensing Center

PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Range-land	Pasture	River	
107516373M	X	X	X	Brush, Cropland, Lake
106317062M	X	X	X	Badland, Grassland
105816415MB	X	X	X	Brush
113016424M	X	X	X	Brush, Dormant Vegetation
113116474M	X	X	X	Grassland, Cropland
113517063M	X	X	X	Snow, Frozen Lake
113116483MB	X	X	X	Fallow Field
114916464M	X	X	X	Scrub, Dormant Vegetation
117017013MB	X	X	X	Snow
118416414M	X	X	X	Grassland, Dormant Vegetation
118416423M	X	X	X	Brush, Dormant Vegetation
118516472M	X	X	X	Grassland, Dormant Vegetation
118316380M	X	X	X	Brush, Lake, Fallow Field

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Range-land	Pasture	River	
111316473MB	X	X	X	Grassland, Dormant Vegetation
114916473MB	X	X	X	Grassland, Dormant Vegetation
105816410MB	X	X	X	Grassland
107616411MB	X	X	X	Grassland, Fallow Field
113016415MB	X	X	X	Grassland, Dormant Vegetation
120216420MB	X	X	X	Grassland, Dormant Vegetation
107716470MB	X	X	X	Grassland, Dormant Vegetation
113216514MB	X	X	X	Grassland, Cropland
102516553MB	X	X	X	Dunes, Irrigation
106217010MB	X	X	X	Dunes, Broken Clouds
106116552MB	X	X	X	Dunes, Irrigation
104417011MB	X	X	X	Dunes, Badland
108117064MB	X	X	X	Badlands, Dormant Vegetation

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Range-land	Pasture	River	
102717063MB	X	X	X	Badlands, Grassland
100917055MB	X	X	X	Grassland
102617010MB	X	X	X	Dunes, Broken Clouds
117117065MB	X	X	X	Snow
104517063MB	X	X	X	Badlands, Grassland
104517065MB	X	X	X	Dunes, Badlands Grassland
108117055MB	X	X	X	Lake, Grassland, Dormant Vegetation
102717054MB	X	X	X	Grassland
102116371MB	X	X	X	Lake, Brush
109416411MB	X	X	X	Grassland, Dormant Vegetation
102216403MB	X	X	X	Broken clouds
113116465MB	X	X	X	Grassland, Brush
106016505MB	X	X	X	Grassland, Cropland
102416505MB	X	X	X	Grassland, Cropland
102316451MB	X	X	X	Grassland, Cropland

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PRODUCT ID (INCLUDE BAND AND PRODUCT)	FREQUENTLY USED DESCRIPTORS*			DESCRIPTORS
	Range-land	Pasture	River	
109516454MB	X	X	X	Grassland, Dormant Vegetation

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